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J.E. Held
South Dakota State University

R.D. Zelinsky
South Dakota State University

R. Beck
South Dakota State University

K. Bruns
South Dakota State University

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OBJECTIVES

To determine the effects of soyhull (SH) based diets on finishing lamb growth performance, feed efficiency and carcass merit.

MATERIALS AND METHODS

Sixty Polypay and Hampshire sired wether lambs were allocated by weight and breed to 20 pens. Dietary treatments, SH-40, SH-60, SH-80 and SH-90 were each assigned randomly to five pens. Diets were balanced to have similar crude protein (14.5 %), metabolizable energy (1.41 Mcal/lb), and calcium:phosphorus ratio (2:1). Dietary ingredient composition for the diets offered in this trial is shown in Table 1. Diets were pelletized and offered through self-feeders for a 10 d adaptation and 56 d finishing period. Lamb growth performance, feed intake and the computed feed efficiency were based on weights recorded at initiation and termination of the 56 d finishing period. Lambs were harvested at a commercial packing plant, approximately 24 h later carcass data (hot carcass weight, fat thickness, body wall thickness, ribeye area and USDA yield and quality grades) were collected by trained lamb carcass evaluators.

Animal performance parameters and carcass data were analyzed statistically as a completely randomized design. The model accounted for variation that resulted from dietary treatment with pen as the experimental unit for animal performance parameters and individual lamb for carcass data. Difference in least squares means for these animal production and carcass parameters that resulted from treatment were separated using the PDIFF option of SAS. Linear and quadratic treatment relationships were tested on animal performance parameters.

RESULTS AND DISCUSSION

The level of SH in the dietary treatment did not affect lamb growth performance (ADG), feed intake (DMI) or feed efficiency (F:G) (Table 2). Although a quadratic relationship for level of SH was detected ($P = 0.021$) for ADG. Animal performance parameters are similar to the results in our previous lamb finishing trials with soyhull based diets. As shown in that study when a diet similar to SH-60 was offered at 90 % ad libitum to rumen fistulated wethers rumen pH dropped below 5.5 at 1 h post feeding and was greater than 5.5 at 4, 8 and 12 h post-feeding. In this same study when feeding a diet similar to SH-40 the lowest recorded rumen pH measurement was 5.7 at 1 h post feeding. Rumen pH less than 5.5 is considered the threshold for potential acidosis. Physical symptoms of acidosis or other digestive disturbances (bloat, dysentery) were absent in this finishing trial although for lambs with sub-clinical acidosis lower DMI and subsequent ADG could have resulted. One lamb died during the trial from complications associated with urinary calculi.

Overall the DMI for the soyhull based diets was equivalent to 3.8 % of live body weight. A high level of intake has been reported in numerous lamb finishing research trials when soyhulls is the primary energy feed. The fiber fraction (NDF 60) of soyhulls ferments rapidly in the rumen and contributes to increased rate of passage compared to traditional finishing diets (corn plus protein pellet supplement). The F:G values shown in Table 2 are consistent with results from our previous lamb finishing trials with soyhull based diets and lambs of similar genotype and target finished weights. Compared to traditional lamb finishing diets the animal response to soyhull based diets has resulted in higher DMI and similar or lower ADG subsequently lower feed efficiency. Results from these past lamb finishing studies have consistently shown a F:G advantage for traditional diets equivalent to 1 lb of DM per lb of gain. Given these animal performance efficiencies a soyhull-based diet at $20 per ton less than a traditional diet would result in similar lamb finishing economics.

Table 3 show the carcass data including hot carcass weight, dressing percent, fat depth, body wall thickness, ribeye area, USDA quality and yield grades, and % BCTRC. Lambs finished on the treatment diets resulted in carcasses with treatment differences for dressing percent ($P = 0.013$), body wall thickness ($P = 0.054$) and % BCTRC ($P = 0.076$). Of the dependent variables in the regression equation to compute %BCTRC, carcass cutability, only differences were detected for body wall thickness. Dressing percent for SH-60 was higher by more than 2 % compared to the other treatment groups. It is difficult to explain biologically this treatment affect however it could be associated with differences in gut fill. Despite this advantage the SH-60 treatment has been shown in this study to promote numerically the lowest animal growth efficiency.

Table 1. Diet ingredient composition (% of DM)

Ingredient	SH-40	SH-60	SH-80	SH-90
Soybean hulls	40.0	60.0	79.0	88.5
Corn	37.0	21.8	7.0	----
DDGS	20.5	16.0	11.8	9.5
Limestone	1.0	0.8	0.8	0.5
Dical	0.5	0.5	0.5	0.5
TMS-Sheep[a]	0.5	0.5	0.5	0.5
Ammonium chloride	0.5	0.5	0.5	0.5
Decoquinate (6.6%)	0.1	0.1	0.1	0.1
Total	100	100	100	100

[a]Sodium chloride 92.6 ≤ 77.4%, zinc 0.9%, manganese 0.71%, iron 0.11%, iodine 90 ppm, cobalt 18 ppm, selenium 90 ppm, Vitamin A, D and E (2,000 IU/lb)

Table 2. Least square growth traits means for lambs offered soyhull based finishing diets

Trait	N[a]	Soyhulls (%) SH-40	SH-60	SH-80	SH-90	SEM	P <	Linear	Quadratic
Initial wt (lb)	5	101.8	100.4	97.0	97.6	2.32	0.43	----	----
Final wt (lb)	5	139.0	131.6	130.0	134.0	3.36	0.29	----	----
ADG (lb/d)	5	0.67	0.52	0.60	0.65	0.042	0.27	0.89	0.021
DMI (lb/d)	5	4.32	3.94	4.57	4.69	0.25	0.12	0.073	0.18
Feed:Gain	5	6.45	7.58	7.62	7.21	0.52	0.18	0.28	0.11

[a]Five pens per treatment

Table 3. Least square carcass traits means for lambs finished on soyhull based finishing diets

Trait	N	Soyhulls (%) SH-40	SH-60	SH-80	SH-90	SEM	P <
HCW (lb)	58	73.20	71.60	68.10	69.80	0.930	0.240
DP (%)	58	52.6[a]	54.40[b]	52.30[a]	51.80[a]	0.290	0.013
FD (in)	54	0.30	0.27	0.23	0.28	0.012	0.220
REA (in)	54	2.91	2.76	2.85	2.67	0.038	0.140
BW (in)	54	1.09[c]	0.99[d]	0.93[d]	1.00[cd]	0.020	0.054
USDA YG	54	3.40	3.10	2.70	3.20	0.120	0.220
USDA QG	58	3.10	3.00	3.00	3.10	0.024	0.580
BCTRC (%)	54	45.10[c]	45.50[cd]	46.20[d]	45.20[c]	0.152	0.076

[ab]Means with different superscripts differ P < 0.05.
[cd]Means with different superscripts differ P < 0.10.
HCW = Hot carcass weight.
DP = Dressing percent.
FD = Fat depth (midpoint of ribeye at 12-13th rib).
REA = Rib eye area (12-13th rib).
BW = Body wall thickness (measured 4.3 in from center of spine).
BCTRC = Boneless-closely trimmed retail cuts = 49.936 – (0.0848 x HCW) – (4.376 x BF) – (3.530 x BW) + (2.456 x REA).